

## CLAIMS

What is claimed is:

1           1. A light generator comprising:  
2           a blue laser for generating a first beam of blue  
3 light;  
4           a first beamsplitter optically coupled to the blue  
5 laser for splitting a second beam of blue light from the  
6 first beam of blue light;  
7           a second beamsplitter optically coupled to the first  
8 beamsplitter for splitting a third beam of blue light  
9 from the first beam of blue light;  
10          a first upconversion laser optically coupled to the  
11 second beamsplitter for generating a beam of green light  
12 from the third beam of blue light; and  
13          a second upconversion laser optically coupled to the  
14 second beamsplitter for generating a beam of red light  
15 from the first beam of blue light.

1           2. The light generator of Claim 1 wherein at  
2 least one of the blue laser, the first upconversion  
3 laser, and the second upconversion laser is a solid-state  
4 laser.

1           3. The light generator of Claim 2 wherein each  
2 of the first and second upconversion lasers comprises:  
3           a laser gain element;  
4           a focusing lens optically coupled to the laser gain  
5 element for focusing blue light onto the laser gain  
6 element;  
7           an input coupler optically coupled to the focusing  
8 lens for transmitting blue light and for reflecting red  
9 light or green light; and  
10          an output coupler optically coupled to the laser  
11 gain element for totally reflecting light generated by  
12 the laser gain element back to the laser gain element.

1           4. The light generator of Claim 3 wherein the  
2 output coupler reflects pump energy that is not absorbed  
3 by the laser gain element back to the laser gain element  
4 to increase optical efficiency.

1           5. The light generator of Claim 3 wherein the  
2 laser gain element is a Pr:YALO crystal.

1           6. The light generator of Claim 3 wherein the  
2 input coupler is a plane mirror or a reflective coating  
3 on an end face of the laser gain element adjacent to the  
4 focusing lens.

1           7. The light generator of Claim 1 further  
2 comprising a mirror optically coupled to the first  
3 beamsplitter for directing the second beam of blue light  
4 in a direction substantially parallel to the first beam  
5 of blue light.

1           8. The light generator of Claim 1 further  
2 comprising a mirror optically coupled to the second  
3 beamsplitter for directing the third beam of blue light  
4 in a direction substantially parallel to the first beam  
5 of blue light.

1           9. The light generator of Claim 1 further  
2 comprising at least one optical modulator to modulate at  
3 least one of the second beam of blue light, the beam of  
4 green light, and the beam of red light.

1           10. The light generator of Claim 1 further  
2 comprising a wavelength selective device optically  
3 coupled to the first beamsplitter, the first upconversion  
4 laser, and the second upconversion laser for combining  
5 the beam of red light, the beam of green light, and the

6 second beam of blue light into a single beam of combined  
7 red, green, and blue light.

1 11. The light generator of Claim 10 wherein  
2 the single beam of combined red, green, and blue light is  
3 substantially white.

1 12. The light generator of Claim 10 wherein  
2 the wavelength selective device is a prism or a  
3 diffraction grating.

1 13. A light generator comprising:  
2 a blue laser for generating a first beam of blue  
3 light;  
4 a first beamsplitter optically coupled to the blue  
5 laser for splitting a second beam of blue light from the  
6 first beam of blue light; and  
7 an upconversion laser optically coupled to the first  
8 beamsplitter for generating a beam of red light and a  
9 beam of green light from the first beam of blue light.

1 14. The light generator of Claim 13 wherein at  
2 least one of the blue laser and the upconversion laser is  
3 a solid-state laser.

1 15. The light generator of Claim 14 wherein  
2 the upconversion laser comprises:  
3 a laser gain element for generating a beam of red  
4 light and a beam of green light from the first beam of  
5 blue light;  
6 a focusing lens optically coupled to the laser gain  
7 element for focusing the first beam of blue light onto  
8 the laser gain element; and  
9 an input coupler optically coupled to the focusing  
10 lens for transmitting blue light and for reflecting red  
11 and green light.

1           16. The light generator of Claim 15 wherein  
2 the laser gain element is a Pr:YALO crystal.

1           17. The light generator of Claim 15 wherein  
2 the input coupler comprises a plane mirror or a  
3 reflective coating on an end face of the laser gain  
4 element.

1           18. The light generator of Claim 13 wherein  
2 the upconversion laser comprises a wavelength selective  
3 element optically coupled to the laser gain element for  
4 separating the beam of red light and the beam of green  
5 light.

1           19. The light generator of Claim 18 further  
2 comprising an output coupler optically coupled to the  
3 laser gain element to partially reflect the beam of red  
4 light or the beam of green light.

1           20. The light generator of Claim 19 further  
2 comprising an optical modulator to modulate at least one  
3 of the second beam of blue light, the beam of green  
4 light, and the beam of red light.

1           21. A light generator comprising:  
2       a blue laser for generating a first beam of blue  
3 light and a second beam of blue light; and  
4       an upconversion laser optically coupled to the blue  
5 laser for generating a beam of red light and a beam of  
6 green light from the first beam of blue light.

1           22. The light generator of Claim 21 wherein  
2 the second beam of blue light, the beam of red light, and  
3 the beam of green light are combined into a single  
4 collinear beam.

1           23. The light generator of Claim 22 wherein  
2 the single collinear beam is substantially white.

1           24. The light generator of Claim 21 wherein at  
2 least one of the blue laser and the upconversion laser is  
3 a solid-state laser.

1           25. The light generator of Claim 24 wherein  
2 the upconversion laser comprises:  
3       a laser gain element;  
4       a focusing lens optically coupled to the laser gain  
5 element for focusing blue light onto the laser gain  
6 element;  
7       an input coupler optically coupled to the focusing  
8 lens for transmitting blue light and for reflecting red  
9 and green light; and  
10       an output coupler optically coupled to the laser  
11 gain element for partially reflecting red and green light  
12 and transmitting blue light.

1           26. The light generator of Claim 25 wherein  
2 the input coupler comprises either a plane mirror or a  
3 reflective coating on an end face of the laser gain  
4 element.

1           27. The light generator of Claim 25 wherein  
2 the laser gain element is a Pr:YALO crystal.

1           28. The light generator of Claim 25 wherein  
2 the upconversion laser comprises a first wavelength  
3 selective element optically coupled to the laser gain  
4 element for separating the red light and the green light.

1           29. The light generator of Claim 28 wherein  
2 the first wavelength selective element is either a prism  
3 or a diffraction grating.

1           30. The light generator of Claim 28 wherein  
2 the output coupler optically coupled to the first  
3 wavelength selective element to partially reflect red  
4 light or green light.

1           31. The light generator of Claim 30 wherein  
2 the output coupler reflects blue light to increase  
3 optical efficiency of the laser gain element.

1           32. The light generator of Claim 30 further  
2 comprising a modulator to modulate at least one of the  
3 second beam of blue light, the beam of green light, and  
4 the beam of red light.

1           33. The light generator of Claim 30 wherein  
2 the upconversion laser comprises a second wavelength  
3 selective element optically coupled to the output coupler  
4 for combining at least two of the beam of red light, the  
5 beam of green light, and the beam of blue light into a  
6 single beam of combined light.

1           34. The light generator of Claim 33 wherein  
2 the single beam of combined light is substantially white.

1           35. A light generator comprising:  
2 means for generating a first beam of blue light;  
3 means for splitting a second beam of blue light from  
4 the first beam of blue light;  
5 means for splitting a third beam of blue light from  
6 the first beam of blue light;  
7 means for generating a beam of green light from the  
8 third beam of blue light; and

9 means for generating a beam of red light from the  
10 first beam of blue light.

1 36. The light generator of Claim 35 wherein at  
2 least one of the means for generating is a solid-state  
3 laser.

1 37. The light generator of Claim 36 wherein  
2 each of the means for generating a beam of green light  
3 and the means for generating a beam of red light  
4 comprises:  
5 a laser gain element;  
6 means for focusing blue light onto the laser gain  
7 element;  
8 means for transmitting blue light and for reflecting  
9 red light or green light produced by the laser gain  
10 element; and  
11 means for partially reflecting light generated by  
12 the laser gain element back to the laser gain element.

1 38. The light generator of Claim 37 wherein  
2 the means for partially reflecting light generated by the  
3 laser gain element back to the laser gain element  
4 reflects pump energy that is not absorbed by the laser  
5 gain element back to the laser gain element to increase  
6 optical efficiency.

1 39. The light generator of Claim 37 wherein  
2 the laser gain element is a Pr:YALO crystal.

1 40. The light generator of Claim 37 wherein  
2 the means for transmitting blue light and for reflecting  
3 red light or green light produced by the laser gain  
4 element is a plane mirror or a reflective coating on an  
5 end face of the laser gain element adjacent to the  
6 focusing lens.

1           41. The light generator of Claim 35 further  
2 comprising means for directing the second beam of blue  
3 light in a direction substantially parallel to the first  
4 beam of blue light.

1           42. The light generator of Claim 35 further  
2 comprising means for directing the third beam of blue  
3 light in a direction substantially parallel to the first  
4 beam of blue light.

1           43. The light generator of Claim 35 further  
2 comprising means for modulating light optically coupled  
3 to at least one of the second beam of blue light, the  
4 beam of green light, and the beam of red light.

1           44. The light generator of Claim 35 further  
2 comprising means for combining the beam of red light, the  
3 beam of green light, and the second beam of blue light  
4 into a single beam of combined red, green, and blue  
5 light.

1           45. The light generator of Claim 44 wherein  
2 the single beam of combined red, green, and blue light is  
3 substantially white.

1           46. The light generator of Claim 44 wherein  
2 the means for combining is a prism or a diffraction  
3 grating.

1           47. A light generator comprising:  
2       means for generating a first beam of blue light;  
3       means for splitting a second beam of blue light from  
4 the first beam of blue light; and  
5       means for generating a beam of red light and a beam  
6 of green light from the first beam of blue light.



1           48. The light generator of Claim 47 wherein at  
2 least one of the means for generating is a solid-state  
3 laser.

1           49. The light generator of Claim 48 wherein  
2 the means for generating a beam of red light and a beam  
3 of green light from the first beam of blue light  
4 comprises:  
5       a laser gain element;  
6       means for focusing the first beam of blue light onto  
7 the laser gain element; and  
8       means for transmitting blue light and for reflecting  
9 red and green light produced by the laser gain element.

1           50. The light generator of Claim 49 wherein  
2 the laser gain element is a Pr:YALO crystal.

1           51. The light generator of Claim 49 wherein  
2 the means for transmitting comprises a plane mirror or a  
3 reflective coating on an end face of the laser gain  
4 element.

1           52. The light generator of Claim 47 wherein  
2 the means for generating a beam of red light and a beam  
3 of green light comprises means for separating the beam of  
4 red light and the beam of green light.

1           53. The light generator of Claim 52 further  
2 comprising means for partially reflecting the beam of red  
3 light or the beam of green light.

1           54. The light generator of Claim 53 further  
2 comprising means for modulating at least one of the  
3 second beam of blue light, the beam of green light, and  
4 the beam of red light.

1           55. A light generator comprising:  
2           means for generating a first beam of blue light and  
3 a second beam of blue light; and  
4           means for generating a beam of red light and a beam  
5 of green light from the first beam of blue light.

1           56. The light generator of Claim 55 wherein  
2 the second beam of blue light, the beam of red light, and  
3 the beam of green light are combined into a single  
4 collinear beam.

1           57. The light generator of Claim 56 wherein  
2 the single collinear beam is substantially white.

1           58. The light generator of Claim 55 wherein at  
2 least one of the means for generating is a solid-state  
3 laser.

1           59. The light generator of Claim 58 wherein  
2 the means for generating comprises:  
3           a laser gain element;  
4           means for focusing blue light onto the laser gain  
5 element;  
6           means for transmitting the blue light and for  
7 reflecting red and green light produced by the laser gain  
8 element; and  
9           means for partially reflecting the red and green  
10 light produced by the laser gain element and for  
11 transmitting blue light.

1           60. The light generator of Claim 59 wherein  
2 the means for transmitting comprises either a plane  
3 mirror or a reflective coating on an end face of the  
4 laser gain element.

1           61. The light generator of Claim 59 wherein  
2 the laser gain element is a Pr:YALO crystal.

1           62. The light generator of Claim 59 wherein  
2 the means for generating a beam of red light and a beam  
3 of green light from the first beam of blue light  
4 comprises means for separating the red light and the  
5 green light.

1           63. The light generator of Claim 62 wherein  
2 the means for separating the red light and the green  
3 light is either a prism or a diffraction grating.

1           64. The light generator of Claim 59 wherein  
2 the means for partially reflecting the red and green  
3 light produced by the laser gain element and for  
4 transmitting blue light is optically coupled to the means  
5 for separating the red light and the green light to  
6 partially reflect only one of the red light or the green  
7 light.

1           65. The light generator of Claim 64 wherein  
2 the means for partially reflecting the red and green  
3 light produced by the laser gain element and for  
4 transmitting blue light reflects blue light to increase  
5 optical efficiency of the laser gain element.

1           66. The light generator of Claim 64 further  
2 comprising means for modulating at least one of the  
3 second beam of blue light, the beam of green light, and  
4 the beam of red light.

1           67. The light generator of Claim 64 wherein  
2 the means for generating a beam of red light and a beam  
3 of green light comprises means for combining at least two  
4 of the beam of red light, the beam of green light, and

5 the beam of blue light into a single beam of combined  
6 light.

1           68. The light generator of Claim 67 wherein  
2 the single beam of combined light is substantially white.